



# Evaluate Alternatives of Network Expansion

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CE3201 Lab #1-3  
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# Project Background

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- Growth of the city and new opportunities introduced new travel demand on the network (The generation rate and attraction rate is now 1.3). Severe traffic jams occurred (look at the Volume/Capacity ratio).
- As a planner of the Sioux Falls City, you are asked to propose improvement on the network in order to adapt the traffic to the development of the city.



# Constraints

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- The total budget for this project is \$12,000,000;
- You don't have to use up the budget but you can't spend more than \$12,000,000;
- All the global variables are fixed except the traffic generation and attraction rate;
- You are not allowed to build any new road;
- You can add capacity up to 4 lane.kilometers (unit cost for expansion is 3,000,000\$/kilomete);



# Procedure

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- Investigate the current Sioux Falls network;
- Expand the existing network;
- Calculate the benefit/cost ratio of proposed expansion in its life cycle;
- Repeat to develop alternatives of road expansion;
- Compare the benefit/cost ratios of alternatives and make your decision.



# Life Cycle Cost Analysis

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- Suppose the life cycle of your road expansion project is 10 years. You need to calculate all the costs of your project over its entire life.
- These costs not only include the initial expansion cost, but also include a series of annual costs, including the costs of maintenance and operation.
- Costs that occur at different times may be placed on a comparable basis by reducing the future amounts to their present value.
- The formulas to calculate the present value of the life cycle cost for our project has been given in the assignment sheet.



# Life Cycle Benefit

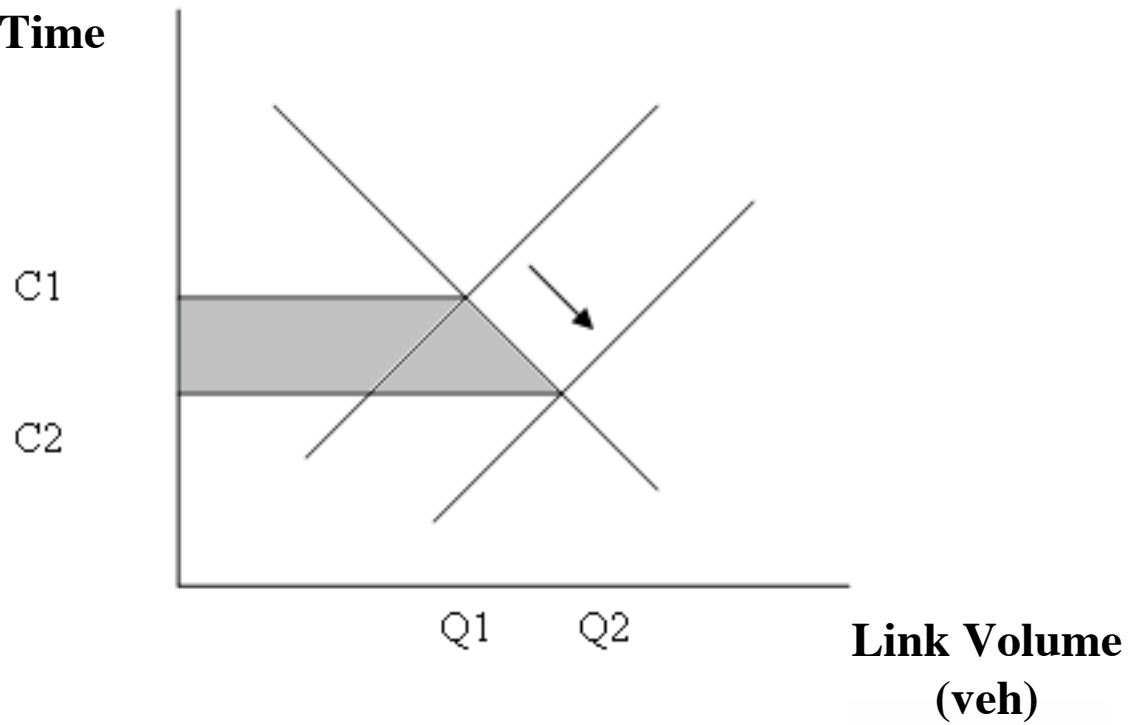
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- $B = K * \text{Sum of } \Delta CS_i$
- $\Delta CS_i$  = the vehicle travel time saving during peak hour on link  $i$  due to your improvements.
- $K$  = a coefficient that converts the vehicle travel time saving during peak hour to the present monetary value of life cycle benefits of proposed expansion.
- For the simplicity of this project,  
 $K = 2 * \text{Auto occupancy} * \text{VOT} * \text{life cycle length} * \text{days of year}$ .

# Consumer Surplus

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**Link Travel Time  
(min)**





# The Final Proposal

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- You are asked to submit a formal proposal of 3-5 pages to the funding agency, in which you need to:
  - 1) describe the background of this project;
  - 2) present at least three alternatives of road expansion on the given Sioux-Falls network;
  - 3) write up the benefit-cost analysis you conducted for the alternatives;
  - 4) propose only one of them for the budget and explain your choice with figures and tables.



# Tasks

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- Read Section 5.2-5.4 of Fricker and Whitford' textbook for life cycle cost analysis, the calculation of consumer surplus and benefit-cost analysis
- You may work in groups and turn in one report as a group (Please print the name of group members clearly, which should not be more than 4).
- The assignment is due next week before the lab.